E. STATISTICS AND PROBABILITY

Content Standard: Students in Wisconsin will use data collection and analysis, statistics and probability in problem-solving situations, employing technology where appropriate.

Rationale: Dramatic advances in technology have launched the world into the Information Age, when data are used to describe past events or predict future events. Whether in the business place or in the home, as producers or consumers of information, citizens need to be well versed in the concepts and procedures of data analysis in order to make informed decisions.

***Performance Standards*: By the end of grade four, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
E.4.1. Work with data in the context of real-world situations by[3] • formulating questions that lead to data collection and analysis • determining what data to collect and when and how to collect them • collecting, organizing, and displaying data • drawing reasonable conclusions based on data	1. Work with data in the context of real-world situations by[3] • formulating questions that lead to data collection and analysis • determining what data to collect and when and how to collect them • collecting, organizing, and displaying data • drawing reasonable conclusions based on data	1.a. Work with real data to • predict the number of M&Ms (or Skittles) in a package(3) • count the number of M&Ms and compare to the prediction (estimation) (52) • count the number of each color (10R, 10Y, 7Br, 11G, 9Bl • present the data (using charts, tables, or graphs) • calculate the cost per M&M. 52/$0.58 = $0.11 (or 1.1 cents per M&M)	
E.4.2. Describe a set of data using[1] • high and low values, and range • most frequent value (mode) • middle value of a set of ordered data (median)	1. Describe a set of data using[2] • high and low values, and range • most frequent value (mode) • middle value of a set of ordered data (median)	1.a. Graph the high and low daily temperatures for two weeks, calculate the range, mode, and median, and display the results(2) 1.b. Predict next week's high and low temperatures, compare the predictions with the actual temperatures, and use a chart to show the comparison(2)	
E.4.3. In problem-solving	1. In problem-solving situations, read,	1.a. Use a daily temperature chart to determine school	

situations, read, extract, and use information presented in graphs, tables, or charts[2]	extract, and use information presented in graphs, tables, or charts[2]	attire(2) 1.b. Create a chart of temperature and appropriate clothing (2)	
E.4.4. Determine if future events are more, less, or equally likely, impossible, or certain to occur[3]	1. Determine if future events are more, less, or equally likely, impossible, or certain to occur[3]	1.a. Graph the high and low daily temperatures for two weeks, calculate the range, mode, and median, and display the results(2) 1.b. Predict next week's high and low temperatures and compare the predictions with the actual temperatures and determine if events are more, less, or equally likely to occur(3)	
E.4.5. Predict outcomes of future events and test predictions using data from a variety of sources[2]	1. Predict outcomes of future events and test predictions using data from a variety of sources[3]	1.a. Graph the high and low daily temperatures for two weeks, calculate the range, mode, and median, and display the results(2) 1.b. Predict next week's high and low temperatures and compare the predictions with the actual temperatures(2)	
***Performance Standards*: By the end of grade eight, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
E.8.1. Work with data in the context of real-world situations by[4] • formulating questions that lead to data collection and analysis • designing and conducting a statistical investigation • using technology to generate displays, summary statistics, and presentations	1. Work with data in the context of real-world situations by[4] • formulating questions that lead to data collection and analysis • designing and conducting a statistical investigation • using technology to generate displays, summary statistics, and presentations	1.a. Brainstorm possible questions to be solved by collecting and analyzing data (e.g., What is your favorite weekend activity, food, fast food restaurant, sports, ice cream flavor, movie, or TV show?) Collect the data and display the data using technology, graphics, charts, and tables(4)	

E.8.2. Organize and display data from statistical investigations using[2] • appropriate tables, graphs, and/or charts (e.g., circle, bar, or line for multiple sets of data) • appropriate plots (e.g., line, stem-and-leaf, box, scatter)	1. Organize and display data from statistical investigations using[2] • appropriate tables, graphs, or charts (e.g., circle, bar, or line for multiple sets of data) • appropriate plots (e.g., line, stem-and-leaf, box, scatter)	1.a. Brainstorm possible questions to be solved by collecting and analyzing data (e.g., What is your favorite weekend activity, food, fast food restaurant, sports, ice cream flavor, movie, or TV show?) Collect the data and display the data using technology, graphics, charts, and tables(4)	
E.8.3. Extract, interpret, and analyze information from organized and displayed data by using[3] • frequency and distribution, including mode and range • central tendencies of data (mean and median) • indicators of dispersion (e.g., outliers)	1. Extract, interpret, and analyze information from organized and displayed data by using[3] • frequency and distribution, including mode and range • central tendencies of data (mean and median) • indicators of dispersion (e.g., outliers)	1.a. Use data from the U.S. Department of Labor, newspapers, math texts, social studies, teacher unions, educational statistics or website to find the following • frequency distribution (2) • mode • range • mean • median 1.b. Based on a career data analysis, choose three possible career choices and justify your choices(3) 1.c. Based on a median income report of men and women in the workforce, predict the student's income in ten years (2) 1.d. Analyze and compare the average earnings of high school graduates and college graduates(3)	
E.8.4. Use the results of data analysis to[3] • make predictions • develop convincing arguments • draw conclusions	1. Use the results of data analysis to[3] • make predictions • develop convincing arguments • draw conclusions	Use activities for E.8.3.-1.a. through 1.d.	
E.8.5. Compare sets of data to generate, test, and, as the	1. Compare sets of data to generate, test, and, as the data dictate, confirm or deny	1.a. Solve problems of the following type: Given the world population growth and current food production, we will run out	

data dictate, confirm or deny hypotheses[3]	hypotheses[3]	of food in ten years. Confirm or deny the above hypotheses by using the data on population growth and current food supplies in selected countries(3)	
E.8.6. Evaluate presentations and statistical analyses from a variety of sources for[3] • credibility of the source • techniques of collection, organization, and presentation of data • missing or incorrect data • inferences • possible sources of bias	1. Evaluate presentations and statistical analyses from a variety of sources for[3] • credibility of the source • techniques of collection, organization, and presentation of data • missing or incorrect data • inferences • possible sources of bias	1.a. Create graphs to present the same data in two different ways, supporting different interpretations (e.g., using two different scales to show profit or loss)(3)	
E.8.7. Determine the likelihood of occurrence of simple events by[3] • using a variety of strategies to identify possible outcomes (e.g., lists, tables, tree diagrams) • conducting an experiment • designing and conducting simulations • applying theoretical notions of probability (e.g., that four equally likely events have a 25% chance of happening)	1. Determine the likelihood of occurrence of simple events by[4] • using a variety of strategies to identify possible outcomes (e.g., lists, tables, tree diagrams) • conducting an experiment • designing and conducting simulations • applying theoretical notions of probability (e.g., that four equally likely events have a 25% chance of happening)	1.a. Use a variety of materials (e.g., dice, beans, cards, and spinners) to illustrate probability(1) 1.b. Create problems to show probability based on experiments using real-world materials (3) 1.c. Evaluate the fairness of a game using a spinner with varying proportions of colors(3)	
***Performance Standards*: By the end of grade twelve, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
E.12.1. Work with data in the context of real-world situations	1. Work with data in the context of real-world situations by	1.a. Formulate hypotheses, collect, and analyze data. Use computer technology to present the result of the	

by • formulating hypotheses that lead to collection and analysis of one- and two-variable data • designing a data collection plan that considers random sampling, control groups, the role of assumptions, etc. • conducting an investigation based on that plan • using technology to generate displays, summary statistics, and presentations	• formulating hypotheses that lead to collection and analysis of one- and two-variable data • designing a data collection plan that considers random sampling, control groups, the role of assumptions, etc. • conducting an investigation based on that plan • using technology to generate displays, summary statistics, and presentations	student's findings • the circumference of a person's waist is at least two times the circumference of the person's neck • measure and record the circumferences of necks and waists on at least 20 people (try to get a variety of people) • use a spreadsheet to show the circumference of necks, the circumference of waists, and the ratio of the waists to the necks • use technology to display the data • find an equation for the data by using the best fit line • test the equation by predicting the waist of a person by using the person's neck measurement. Determine the correlation by comparing the prediction to the actual waist measurement	
E.12.2. Organize and display data from statistical investigations using • frequency distributions • percentiles, quartiles, deciles • line of best fit (estimated regression line) • matrices	1. Organize and display data from statistical investigations using: • frequency distributions • percentiles, quartiles, and deciles • line of best fit (estimated regression line) • matrices	Use activity for E.12.1.-1.a.	
E.12.3. Interpret and analyze information from organized and displayed data when given • measures of dispersion, including standard deviation and variance • measures of reliability • measures of correlation	1. Interpret and analyze information from organized and displayed data when given: • measures of dispersion, including standard deviation and variance • measures of reliability • measures of correlation	Use activity for E.12.1.-1.a.	
E.12.4. Analyze, evaluate, and	1. Analyze, evaluate, and critique the	1.a. Evaluate and analyze data from newspaper, magazine,	

critique the methods and conclusions of statistical experiments reported in journals, magazines, news media, advertising, etc.	methods and conclusions of statistical experiments reported in in various sources (e.g., journals, magazines, news media, and advertising)	Internet, and other sources. (Note: The graphs on the corners of *USA Today* are great! There is a published collection of them.)	
E.12.5. Determine the likelihood of occurrence of complex events by • using a variety of strategies (e.g., combinations) to identify possible outcomes • conducting an experiment • designing and conducting simulations • applying theoretical probability	1. Determine the likelihood of occurrence of complex events by • using a variety of strategies (e.g., combinations) to identify possible outcomes • conducting an experiment • designing and conducting simulations • applying theoretical probability	1.a. Formulate hypotheses, collect, and analyze data. Use computer technology to present the result of the student's findings • the circumference of a person's waist is at least two times the circumference of the person's neck • measure and record the circumferences of necks and waists on at least 20 people (try to get a variety of people) • use a spreadsheet to show the circumference of necks, the circumference of waists, and the ratio of the waists to the necks • use technology to display the data • find an equation for the data by using the best fit line • test the equation by predicting the waist of a person by using the person's neck measurement. Determine the correlation by comparing the prediction to the actual waist measurement (same activity as E.12.1. through E.12.3.)	